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Explosives Div.



Canada
Department of Mines
and Technical Surveys

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[Annual]

Report of the

EXPLOSIVES DIVISION



Calendar Year
1953



Canada
Department of Mines
and Technical Surveys

Report of the

EXPLOSIVES
DIVISION

Calendar Year 1953

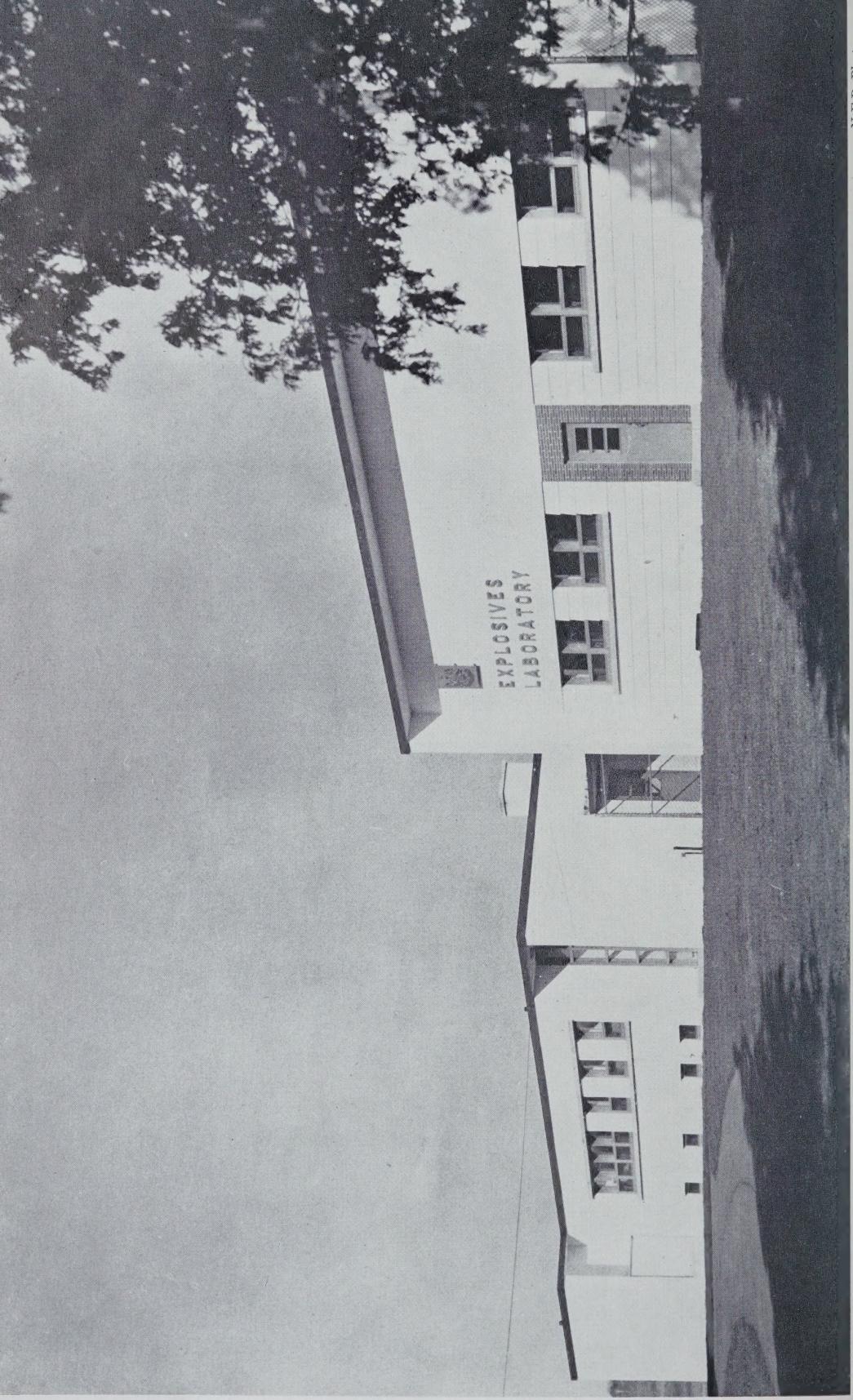
by
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The New Explosives Laboratory, River Road, Ottawa



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This report deals with the administration of the Explosives Act for the year ended December 31, 1953, supplementing the brief report of the Explosives Division included in the Annual Report of the Department for the fiscal year 1953-54.

Offices

The Explosives Division maintains its main office at the Motor Building, 238 Sparks Street, Ottawa, and branch offices at 300 West Pender Street, Vancouver, B.C. and 7 Terminal Road, Halifax, N.S. Its chemical staff now occupies the newly built laboratory on River Road, near Uplands airport, Ottawa, thus ending an arrangement started in 1942 whereby the Explosives Division and the National Research Council jointly operated an explosives laboratory at the Council's Annex, Montreal Road. Work began on the laboratory late in 1952 and it was ready for occupancy in May.

The interior arrangements of the new laboratory are much the same as in the buildings vacated but a saving in cost and ground space, without loss of usefulness or sacrifice of safety, has been effected by combining two buildings which were formerly separate units. The main group of buildings consists of a general chemical laboratory with balance room, dark room, special projects laboratory, offices, lunch room and a commodious basement for the storage of chemicals and equipment; a physical testing laboratory occupies a separate building divided into two main sections by a substantial concrete wall, one section housing a ballistic mortar, Rotter impact machine and other testing equipment for determining the physical properties of explosives; the other section is further divided by strong walls into four cubicles, each of which provides isolated space for carrying out work of a hazardous or special nature. A smaller group of buildings includes a substantially reinforced concrete chamber and a wooden hut, providing facilities for carrying out velocity of detonation tests and photographic studies, by revolving drum camera, of the flame and other characteristics of explosives. Two magazines, one for the storage of detonators and the other for blasting explosives complete the group.

Legislation

In the interval since the Explosives Act, 1946 came into force, certain problems in its administration have become apparent. To remedy these, a bill to amend the Explosives Act was drafted and in due course referred to the Senate early in December. Approval was given on the 10th of December, 1953 but it did not come up for consideration in the House of Commons before Parliament adjourned at the close of the year. It is expected that the bill will be considered by the House early in 1954.

Manufacture

Commercial blasting explosives manufactured in Canada in 1953 amounted to 119,153,870 pounds a slight increase over production in 1952. The total quantity of Classes 1, 2 and 3 explosives manufactured also exceeded the previous year, as is noted in Appendix B.

Factories, Magazines and Registered Premises

The number of licences for factories issued in 1953 was 19, detailed in Appendix A. A new fireworks factory built by T. W. Hand Fireworks Company, Papineauville, Que. commenced operation. Licences for temporary magazines amounted to 1,072, an increase of 160 over the previous year and the highest for this class of magazine yet issued. Permanent magazine licences, i.e. those operated on a permanent basis chiefly by dealers, totalled 450 this year, a gain of 40 over the previous year and again the highest yet issued for this class. An increased number of certificates for registered premises were issued to merchants who sell small quantities of explosives to casual users. Certificates issued in Newfoundland have shown a large increase; in some measure this is due to the widespread sale of gunpowder, which is sold in small lots to users in the "outports" for re-filling shotgun shells used in hunting seal and sea fowl. Certificates for registered premises issued in 1953 amounted to 115, an increase of 33 over 1952 and the largest per centum increase of any group.

Inspections

Inspectors of the Division carried out 38 inspections of factories licensed under the Act. Inspections of magazines by Division inspectors and by deputy inspectors of the R.C.M.P. totalled 1,452, while inspections of registered premises amounted to 160. In addition 3,513 unlicensed premises were visited chiefly for the purpose of inspecting records of the retail sale of small arms ammunition of calibre in excess of .23 inch.

Explosives Laboratory

Examination and testing of explosives required in the administration of the Explosives Act were carried out by Division chemists. The explosives tested comprised samples of all new commercial high explosives submitted for authorization, samples of authorized explosives taken for checking by our inspectors during the course of factory inspections and samples of fireworks submitted for authorization and suitability for importation. The fireworks were principally of British and Chinese origin, the bulk of the latter being "firecrackers". Some American and German made fireworks were also tested. Explosives or materials suspected of explosive properties were examined for the information of other government departments among which were the Post Office Department, R.C.M.P., National Harbours Board and Department of National Defence.

Samples examined are classified as follows:

Blasting explosives etc.....	25
Fireworks, Chinese firecrackers and toy pistol caps..	724
Miscellaneous explosives, etc., such as ammunition and samples submitted by R.C.M.P. and Post Office Department.....	11
	760

Report for 1953

Certain special projects were undertaken, among which were tests conducted on a laboratory scale for the information of the National Harbours Board, on the possible effect of fire and prolonged application of high temperature on chemical fertilizers composed of mixtures of ammonium nitrate, ammonium sulphate and calcium carbonate, in relation to their handling and transportation. A resume was also prepared of reported tests and other sources of information for Air Materiel Command, Department of National Defence on the effect of extremes of temperature on the behaviour of some explosives.

Imports

Explosives imported during the year are listed in Appendix C under Classes and Divisions. Manufactured fireworks imported showed a great increase, having almost doubled from 872,200 pounds in 1952 to 1,651,839 pounds in 1953. The highest single item imported was nitrocotton, used in the manufacture of lacquers, coated fabrics, etc.; it amounted to over 4,000,000 pounds. The imports were made under the authority of 768 permits and 18 annual permits, an increase of 48 over the previous year.

Prosecutions

Proceedings were instituted in nine instances for breach of the Explosives Act and Regulations thereunder and convictions were obtained in all and fines imposed. Four firms were fined for selling explosives without a licence; fines were imposed on three individuals and one firm for improper storage of explosives, the neglect of two of them to provide safe storage having resulted in injury to two boys. The driver of a truck carrying explosives, who stopped longer than necessary in a public place was prosecuted and fined. Fines levied ranged from \$10.00 and costs to \$50.00 and costs.

Destruction of Explosives

Under the direction of the Minister, the Division may seize and destroy or otherwise dispose of abandoned or deteriorated explosives which are a danger to persons or property. In most cases, owners of explosives which have become deteriorated because of poor storage or direct contact with water, readily co-operate with the Division in destroying them. During the year 25,103 pounds of blasting explosives, 10,381 detonators, 20 cases of fireworks and one case of Chinese firecrackers were destroyed. Wet conditions and poor ventilation are the common causes of deterioration of blasting explosives. One lot of 5,900 pounds of blasting explosives in the Northwest Territories was destroyed for these reasons and a flood in Quebec took toll of 5,400 pounds. Bad, prolonged storage also affects detonators and makes them uncertain in functioning; 7,000 in one lot were destroyed because of this.

Thefts

During the year three magazines and two unlicensed premises were forcibly entered and approximately 1,525 pounds of blasting explosives and 287 detonators were stolen. Some of the explosives were recovered by the

police but 1,300 pounds of blasting explosives taken from a magazine in Nova Scotia were not. Inspectors of the Division are constantly urging owners or operators of magazines to maintain and improve the security of their magazines by the installation of proven locking devices.

Accidents

In Appendix D are listed accidents in which explosives were involved. These accidents numbered 127 and resulted in death to 29 persons and injury to 149, close to the average for the past five years, namely, 132 accidents with 29 deaths and 142 injured. In comparison, 1934 saw 227 accidents in which 38 persons were killed and 244 injured, but the quantity of explosives produced in 1934 was less than one-third the amount produced in 1953. In other words, 1953 exposure was more than three times that of 20 years ago, but the number of accidents was about one-half.

In Manufacture

Despite high commercial production in 1953 no accident occurred involving explosives in the manufacture of Classes 1 to 3 explosives, a record maintained for the past seven consecutive years. Safety committees, alert supervisors and safety-minded employees, encouraged by company sponsored safety competitions, have all had a part in creating this record.

In the manufacture of detonators, ammunition and sensitive explosives, minor explosions invariably occur. The protection provided in the form of screens and guards for the safety of operators and the relatively small quantities of explosives handled are no doubt important factors in preventing serious accidents to personnel and damage to equipment. Nine accidents were reported and 12 persons injured, only one seriously.

As an example under this heading, at a shell filling plant three men were injured, one seriously when some rejected military detonators were being prepared for destruction. The accident was the result of carelessness and negligence in handling. Serious violation of standing process instructions for the operation were reported by the Division inspector who investigated the accident and both the explosives and man limits for which the building was licensed had been disregarded. The explosion occurred when detonators were being transferred, "poured", from a small container to a larger one and the probable cause was considered to be the impact of falling detonators. The employee handling the detonators suffered serious injuries to his hands, eyes and face but the others, who were onlookers, were only injured slightly. Recommendations were issued for closer supervision of the laid-down instructions and building limits. The destruction of explosives must, of necessity, be carried out at remote areas in plants, and consequently supervisors tend to neglect regular visits and checks on such operations.

In Use

In 1953 nine more accidents occurred in the use of explosives than in the previous year, but the results were almost the same, bringing death to 26 persons and injuries to 82, compared with 26 and 84 respectively for 1952.

Report for 1953

Following is a tabulation of accidents in the use of explosives for the ten years 1943 to 1952 inclusive.

	Mines and Quarries		Logging, Construction, Farming, etc.	
	Killed	Injured	Killed	Injured
1943.....	9	21	3	15
1944.....	4	59	4	20
1945.....	3	46	6	15
1946.....	9	52	10	26
1947.....	16	62	12	43
1948.....	11	65	17	43
1949.....	11	56	11	34
1950.....	4	54	6	24
1951.....	5	48	13	33
1952.....	10	62	16	22
Average for 10 years.....	8.2	52.5	9.8	27.5
1953.....	6	57	20	25

The above table indicates that fatalities in mines and quarries in 1953 were well below the average for the ten-year period but in logging, construction, farming, etc. they were more than double the average and three times as great as for mines and quarries. Farming alone contributed five fatalities to the total, an unusually high number which serves to illustrate the extent to which casual users are prone to accidents in the use of explosives. Considering the comparative quantities of explosives used by the above two groups, the accident record of mines and quarries reflects great credit on the control exercised by provincial departments and the mining industry.

Common causes of accidents were: (a) remaining too long at the site of the blast, (b) failure to observe that the fuse was lit and burning, (c) failure to allow sufficient time to light the shot, and (d) using too short a fuse. In an effort to eliminate common faults in lighting safety fuse the Explosives Division has distributed a pamphlet illustrating a safe way to light fuse.

Principal causes of accidents rank in this order:

	No. of accidents	Killed	Injured
1. Delaying too long on lighting fuse	22	5	25
2. Projected debris.....	15	3	13
3. Returning too soon after blast...	13	5	9
4. Drilling into explosives.....	12	2	14
5. Various.....	10	8	5

A short account of some unusual accidents follows:

A farmer in British Columbia was preparing an anchor hole 4 feet long and 2 feet wide for a hydro pole. He placed two sticks of dynamite in the hole about 6 inches apart with two fuses 10 inches and 7 inches in length. (Three feet is the safe minimum). He went down into the hole and lit the first fuse

but had difficulty lighting the second fuse. His son reported that he lit several matches in attempting to light the second fuse and was still in the hole when the first shot exploded and killed him.

In Nova Scotia an old wharf was being demolished and a case of dynamite containing a primed cartridge and lead wires was lowered by a rope to the base of the wharf which was under water. When the blaster was connecting the lead wires to an electric switch the dynamite exploded and the blaster was killed. The switch was found in the "off" position and it is presumed that the case of dynamite had settled on a submerged timber or rock, fell off and struck some object that caused it to explode.

An employee of a logging company in British Columbia was killed when struck by a stump from a blast 350 feet away. The coroner's jury recommended that the blaster, who did not have a blaster's certificate, be prohibited from using explosives and that the company be held negligent in having allowed an unauthorized person to do so. Other violations of the regulations came to light, including storing explosives too close to where the rigging crew was working.

Another fatal accident occurred in logging work in British Columbia when a blaster jumped back to avoid a flying rock and stepped on a sack containing blasting caps which a few minutes before he had placed on the ground behind him. The caps exploded, inflicting injuries from which the blaster died. Had the caps been kept in a receptacle with rigid sides such an accident would not have happened. Employers have an obligation to provide powdermen with proper receptacles for "on the job" storage of explosives.

In northern Ontario an employee of a lumber company was blasting rocks and tree stumps from a road. He carried the explosives he needed (blasting explosives, detonators, and fuse, together), in a small haversack slung over his left shoulder. Apparently flying debris from a blast struck the haversack he was carrying and set off the explosives, killing him instantly. Here again proper storage would have prevented the accident.

In Alberta workmen on oil exploration work were shooting the last shot for the day, two charges had been fired but apparently did not record the information desired. A third charge had been prepared and placed in the hole but the shooter's helper (in violation of company orders and without the knowledge of the blaster) prepared a fourth charge which he held in his hand. The lead wires of the newly prepared charge were unwittingly picked up by the shooter who connected them to the battery and fired the shot without first checking the lead wires. Both the helper and shooter were killed. The explosion of the charge the helper held set off the stock of explosives in the truck, amounting to about 100 pounds.

In Saskatchewan an oil exploration party was working along an improved road allowance. A charge was fired in a hole 37 feet deep using a seismic cap with 60-foot lead wires. After the explosion the cap leads blew into the air, parted from the connecting leads, and settled on a single-wire high tension power line carrying 13,800 volts. The ends of the lead wires reached to about 9 feet from the ground and an employee drove a truck under the wire, climbed on to the cab and attempted to dislodge the lead wires. He was electrocuted and died. A fatal accident occurred last year under similar circumstances.

Miscellaneous

The number of accidents which occurred during 1953 under the heading "Miscellaneous" shows some improvement over 1952. Improvement is particularly noted in the number killed, only 3 as compared with 16 last year, although the number injured increased. A short summary of these is given in Appendix D.

Injuries as a result of accidents with fireworks were more numerous than in the previous year, quite a number being due to persons tampering with "dud" display fireworks which had failed to fire and were left in the display area.

Just how careless adults can be in handling dangerous fireworks is well illustrated by the following incident. During a fireworks display at the opening of a "super-market" in a southern Ontario town, part of a shell which failed to explode in the air was picked up by a young man. Instead of turning it over to the police he put it in his car and next morning took it to his place of business, where it was later handled by two other employees, one of whom admitted smoking at the time. By accident or simple negligence, the fuse became ignited and without thought of the consequences the shell was dropped or thrown on the floor and rolled under a desk at which a 19-year old man was seated. The shell exploded, tore flesh from the ankle of the young man at the desk, shattered two desks, smashed four plate-glass windows and made holes in the ceiling and walls of the office. There was some doubt whether the young man's foot could be saved.

Carelessly stored or forgotten detonators continue to take their toll, and accidents recorded under the heading "Playing with Detonators" resulted in injuries to 20 youths and 1 adult. Safe storage of detonators and blasting explosives cannot be over stressed. Too often adults hide explosives where children have access to them. A moral responsibility devolves on everyone who uses explosives or has them in his possession to keep them locked up and when taken out for use to account for all when the day's work is completed. Powdermen have not always received the co-operation of their employers and superintendents in providing substantially locked receptacles for the storage of dynamite and detonators at the place of use. Employers are under obligation to supply these no matter how small the quantity of blasting explosives or how few the number of detonators required for a job. On several occasions contractors have been negligent regarding the safe-keeping of detonators and children have picked them up near the place of use. Fortunately, in some such cases, accidents have been avoided by the good sense of a passerby who recognized the danger and took the detonators from the children before damage was done. In areas where blasting is being done, parents can help by warning their children to avoid such areas and should detonators be discovered, by reporting the same to the police.

APPENDIX A**Factories Licensed to Manufacture Explosives, 1953**

Owner	Location of factory	General nature of product
Canadian Industries Ltd.	Beloeil, Que.	Blasting explosives, black powders, propellants.
Canadian Industries Ltd.	James Island, B.C.	Blasting explosives.
Canadian Industries Ltd.	Nobel, Ont.	Blasting explosives.
Canadian Industries Ltd.	Brainerd, Man.	Blasting explosives.
Canadian Industries Ltd.	Brownsburg, Que.	Ammunition, detonators, fuses, etc.
Canadian Industries Ltd.	Calgary, Alta.	Blasting explosives.
Canadian Safety Fuse Co.	Brownsburg, Que.	Safety fuse, detonating fuse, fuse lighters.
Canadian Arsenals Ltd.	Beloeil, Que.	Time Ring Fuse Powder.
Canadian Arsenals Ltd.	St. Paul l'Ermite, Que.	Filling military shells, fuses, etc.
Canadian Arsenals Ltd.	Valcartier, Que.	Filling military small arms ammunition.
Canadian Arsenals Ltd.	Valleyfield, Que.	Military explosives, propellants.
North American Cyanamid Ltd.	Niagara Falls, Ont.	Nitroguanidine.
T. W. Hand Fireworks Co.	Cooksville, Ont.	Fireworks and military pyrotechnics.
T. W. Hand Fireworks Co.	Papineauville, Que.	Military pyrotechnics.
Macdonald Metals and Plastics	Waterloo, Que.	Toy pistol caps.
Montreal Fireworks Co.	Ville St. Pierre, Que.	Display fireworks.
Superior Toy Co.	Waubaushene, Ont.	Toy pistol caps.
W. F. Bishop & Son.	Unionville, Ont.	Fireworks.
Joseph J. Godin (Interstate Fireworks)	Newmarket, Ont.	Fireworks.

Production of Explosives in Canadian Factories, 1953

—	Quantity
Class 1. Gunpowder.....	
Class 2. Nitrate mixtures.....	558,750 lb.
Class 3. Nitro-compounds—	
Division 1.....	119,153,870 lb.
Division 2.....	26,345,737 lb.
Class 6. *Ammunition—	
Division 1—	
Safety Cartridges (rounds).....	238,093,255
Safety fuse and primacord.....	Output of one factory
Railway Track Signals.....	Output of one factory
Percussion Caps.....	Output of one factory
Division 3—	
Detonators and electric detonators.....	Output of one factory
Class 7. Fireworks—	
Division 2—	
Commercial and display fireworks, fuse lighters, toy caps and fuses. (Approx. value).....	\$ 1,534,716

* Exclusive of artillery ammunition and small arms ammunition made in Government factories.

APPENDIX C

Explosives Imported into Canada, January 1 to December 31, 1953

Class	Division	Description	Quantity
1		Gunpowder.....	41,081 lb.
2		Nitrate Mixtures.....	118,956 lb.
3		Nitro-Compounds:	
	1	Nitroglycerine explosives:.....	13,223 lb.
	2	(a) Propellants.....	6,882 lb.
		(b) For use in explosives factories.....	869,144 lb.
		(c) For other manufacturing purposes.....	4,105,572 lb.
5		Fulminates.....	450 lb.
6	1	Primers.....	471,216 only
	1	Safety Fuse.....	21,000 ft.
	2	Detonating Fuse.....	85,780 ft.
	3	Detonators.....	107,585 only
		Seismic Explosives.....	29,060 lb.
		Miscellaneous.....	567,744 lb.
7		Manufactured Fireworks.....	1,651,839 lb.

APPENDIX D
Report for 1953
Part I

Accidents from Explosives during the Calendar Year 1953

Circumstances or Cause	Mines and Quarries, Number of Accidents			Elsewhere, Number of Accidents			Total, Number of Accidents		
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured	Killed
I. Use.									
(a) Delaying too long in lighting fuse.....	14	.....	21	8	5	4	22	5	25
(b) Premature firing of electrical blasts.....	2	.....	2	3	2	1	5	2	3
(c) Not taking proper cover.....	3	1	2	12	2	11	15	3	13
(d) Projected debris.....	7	2	6	6	3	3	13	5	9
(e) Returning too soon after blasting.....	1	.....	1	.....	1	1	1	1	1
(f) Improper handling of misfires.....	3	.....	3	1	1	1	4	1	3
(g) Rough tampering.....	7	2	9	5	5	5	12	2	14
(h) Ignition of explosives by flames, sparks, etc.....	5	.....	6	.....	5	5	2	6	6
(i) Drilling into explosives.....	2	.....	2	.....	2	2	2	2	2
(j) Striking unexploded charge in removing debris.....	1	.....	1	.....	1	1	1	1	1
(k) Preparing charges.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
(l) Using too short a fuse.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
(m) Insufficient ventilation after blasting.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
(n) Stringing shots.....	3	1	4	7	7	1	10	8	5
(o) Inadequate guarding.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
(p) Various.....	48	6	57	42	20	25	90	26	82
In Manufacture.....									
In Keeping.....	.....	.....	.....	.....	.....	.....	9	.....	12
In Conveyance (other than by railway).....	.....	.....	.....	.....	.....	.....	1	.....	2
Total.....	.....	.....	.....	.....	.....	.....	*10	.....	14
Miscellaneous									
(a) Playing with detonators.....	.....	.....	.....	.....	.....	.....	12	.....	21
(b) Playing with other explosives.....	.....	.....	.....	.....	.....	.....	9	1	8
(c) Various.....	.....	.....	.....	.....	.....	.....	6	2	4
Total.....	.....	.....	.....	.....	.....	.....	**27	3	53
Totals all circumstances.....	48	6	57	42	20	25	127	29	149

* Except for these, accounts of which are given in the text, the accidents given in this table occurred in circumstances not directly controlled by the Act.

** Circumstances are given on next page.

APPENDIX D

Part II

Playing with Detonators

Ref. No.	Cause of Accident	Killed	Injured
3	Two boys, ages 13 and 8, found four detonator caps that had been left over from a construction job and hidden in an old washing machine by one of the workmen. The older boy held a lighted match to one cap and it exploded. He lost three fingers and his companion suffered burns to the face.....		2
14	A prospector hid a part box of blasting caps in a bedroom closet in his home. His son, age 13, and a companion age 11 found the caps, tried to light one and it exploded. One boy had three fingers badly mangled and the other received injuries to his arm. The father was prosecuted for improper storage and fined.....		2
23	Three young boys found a dynamite cap on the road and struck it with a rock causing an explosion. One boy, age 5, lost his thumb and parts of three fingers and the other boys were injured by flying metal.....		3
38	A boy, age 13, lost a thumb and two fingers when he held a dynamite cap and applied a match to it. Three companions were cut about the face. The boys found the caps at a construction camp.....		4
45	Striking a dynamite cap he had found in the woods with an axe resulted in the loss of an eye to an 11-year-old boy.....		1
109	Four small boys were injured in the explosion of an electric blasting cap found near a sewer excavation. One of the boys took the cap and was swinging it around by the lead wires when it struck a rock and exploded. The boys suffered minor injuries.....		4
136	A group of teen-age boys found a cache of dynamite and blasting caps in an old barn. One of the boys, age 14, took a cap and was playing with it when it exploded blowing off parts of his thumb and two fingers. An investigation was conducted by the police and the owner of the explosives prosecuted and fined.....		1
141	A 10-year-old boy found a box of detonators in an old shed behind his house. He held one in his hand and applied a match. In the resulting explosion his hand was so badly mangled that it had to be amputated.....		1
172	A boy, age 12, suffered injuries to his hand and fingers when playing with blasting caps.....		1

APPENDIX D—Continued
Part II—Continued

Playing with Detonators—Concluded

Ref. No.	Cause of Accident	Killed	Injured
189	A teen-age boy found a box of detonators stored with nails, nuts and bolts and safety fuse in a feed shed on a farm where he was staying. In a box under the house he also found 3 sticks of stumping powder. He attempted to prime a stick of stumping powder with a detonator and fuse but accidentally set off the detonator while preparing the charge. The powder did not explode or the boy would undoubtedly have been killed. He lost a finger and received injuries to his eye.....		1
219	A miner was playing with a detonator attached to a fuse during lunch hour when it exploded, injuring his hand.....		1

APPENDIX D—Continued

Part II—Continued

Playing with Other Explosives

Ref. No.	Cause of Accident	Killed	Injured

Small Arms Ammunition

58	When he tried to light a small pouch of gunpowder he had found in his grandfather's hunting kit an 11-year-old boy received serious burns to his face and eyes.....		1
----	---	--	---

Fireworks

33	A girl, age 10, suffered burns to her neck and back when a firecracker thrown at her exploded.....		1
35	A boy, 16, was severely burned on the right leg when a packet of firecrackers in his pocket caught fire.....		1
63	Six children were burned with fireworks in Victoria Day celebrations in the Toronto area. Several fires were also started causing several hundred dollars damage.....		6
68	Thirteen persons received burns, four requiring hospital treatment when an aerial bomb exploded prematurely during a fireworks display.....		13
84	Four children were injured when they tried to set off "dud" fireworks they collected following a display.....		4
112	A boy, age 12, required hospitalization for arm burns he suffered when he and his companions tried to ignite a "dud" explosive they found among refuse left after a fireworks display.....		1
147	An aerial bomb that failed to explode during a fireworks display was taken by a young man into an office, ignited and tossed under a desk. A man at the desk suffered severe foot injuries.....		1

Military Explosives

32	An eight-year-old boy was killed when a souvenir mortar bomb he was using to straighten nails in his basement exploded. Following the accident police rounded up 32 other war souvenirs in the district and had them destroyed.....		1
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Various

Ref. No.	Cause of Accident	Killed	Injured
1	A 51-year-old labourer was killed when he set off a stick of dynamite in his one room shack.....	1	
18	A premature explosion of a 25 pound shell at a military camp caused fatal injuries to a young officer.....	1	
28	A 69-year-old Chinese attempted suicide by setting off a dynamite cap in a lard pail. He was severely injured..		1
99	At an army depot a young man was attempting to remove the top from a can of detonators when they exploded and he was injured.....		1
187	An employee at a construction camp suffered permanent injury to his right hand as a result of a prank by fellow workers who made fireworks from detonator caps and tossed them into the sleep hut. The men responsible were given a jail term and ordered to pay damages.....		1

APPENDIX E

Authorized Explosives

Authorized Explosives manufactured by Canadian firms:

Canadian Industries Limited (Explosives Division)—

Ammonia Dynamite—20, 25, 30, 35, 40, 50 and 60 per cent.

Ammonia Dynamite quarrying—60 per cent.

Black Blasting Powder.

Black Sporting Powder.

Blastol—60 per cent.

B.R.X-7—75 per cent.

B.R.X-7 (D.N.T.)—75 per cent.

Cigel—50 per cent.

Cigel (D.N.T. or T.N.T.)—50 per cent.

Cordite—MD, MDT, W, WT, WM, WMT.

C-X-L Dynamite—Nos. 1, 2, 3 and 4.

C-X-L Gelatin—Nos. 1 and 2.

C-X-L-ite.

Di-Drill Gelatin—60 per cent.

Ditching Dynamite—50 per cent.

Ditching Dynamite (D.N.T.)—50 per cent.

Driftite—70 per cent.

Driftite (D.N.T. or T.N.T.)—70 per cent.

Dygel—75 per cent.

Dynamex (Diameters 1" to 1½" incl.)—40, 50, 60 and 70 per cent.

Dynamex (Diameters 1½" and over)—40, 50, 60 and 70 per cent.

Explosives BL-100—60 per cent.

BL-103

BL-106

Forcite—30, 35, 40, 40 (Asbestos Corporation),

50, 60, 75, 75 (bagged), 80 and 90 per cent.

Forcite—(Brainerd Series)—30, 40, 50, 60 and 75 per cent.

Forcite (D.N.T. or T.N.T. Series)—30, 35, 40, 40 (Asbestos Corporation),

50, 60, 75, 75 (bagged),

80 and 90 per cent.

Free Running Ammonia Dynamite—65 per cent.

Fuse Powders—30, 40, 44, 53, 57 and 65 seconds.

Gelatin Dough—90 per cent.

Geogel.

Gelignite—62 per cent.

Giant Gelatin—30, 35, 40, 50, 60, 75, 80 and 90 per cent.

Giant Gelatin (Brainerd Series)—40 and 60 per cent.

Giant Gelatin (D.N.T. or T.N.T. Series)—20, 25, 30, 35, 40, 50, 60, 75, 80 and 90 per cent.

Guhr Dynamite.

Guncotton.

Gunpowder.

Gypsumite "A", "B" and "C".

Hi-Velocity gelatin—60 and 80 per cent.

Igniter Cord Electric Starter.

Liquid Nitroglycerine.

Lump-Kol Pellet Powder.

Monobel—Nos. 4, 6, 7, 10 and 14.

Monobel, sheathed—Nos. 4, 7, and 10.

Monobel, No. 11.

Monobel X (EQ.S.).

Nitrocotton.

Pellet Powder No. 2.

Primacord MS Connector.

Polar Stumping Powder—20 per cent.

Signal Bombs.

S.N.G.

"Special No. 1" Dynamite.

Stopeite—20, 25, 30, 35, 40, 50, 55 and 60 per cent.

Submagel—60, 75 and 95 per cent.

Trinitrotoluene.

Vibrex—60 per cent.

Authorized Explosives—Continued

Canadian Safety Fuse Company Ltd.

Safety fuse—"Beaver" Brand.
Safety fuse—"Black Clover" Brand.
Safety fuse—"Black Pacific" Brand.
Safety fuse—"Clover" Brand.
Safety fuse—"Crown" Brand.
Safety fuse—"Moose" Brand.
Safety fuse—"Pacific" Brand.
Safety fuse—"White Jacket" Brand.
Safety fuse—"Yellow Jacket" Brand.
Hot Wire Fuse Lighters.
Igniter Cord—"Thermalite" Brand. Types A and B.
Primacord-Bickford Detonating Fuse.

Canadian Industries Limited (Ammunition Division)

Ammunition.
Detonators.
Dextrinated Lead Azide.
Fuse Igniting and Connecting device.
"Lead Salt."
Lead Siphnate (Normal).
Percussion Caps.
Railway Fusees.
Railway Torpedoes.
Safe-T-Lite Highway Flare.
Styphnic Acid.
Tetrazene.

Authorized explosives manufactured by other than Canadian firms:—

Fred Allen, Houston, Texas.

Cartridges for "Super-gun".

Atlas Diesel Co., Stockholm, Sweden.

Engine Starting Cartridges (including Ignition Papers and Caps).

Atlas Powder Co., Wilmington, Del.

Shaped Charges.
Detonators (Blasting Caps).

Cardox Corporation, Chicago, Ill.

Cardox.
Cardox Heaters.

Cartoucherie Francaise, Paris, France.

.22 Blank Cartridges.

Central Railway Signal Company, Boston, Mass.

Railway Torpedoes.

De Kruithoorn N. V. Nederlandsche Jachtpatroonfabriek, 's-Hertogenbosch, Holland.

Shotgun Shells 12, 16, 20 gauge.

E. I. DuPont de Nemours & Company, Inc., Wilmington, Del.

Auxiliary Charges C. 63.
Detonators.
DuPont Bulk Powder.
DuPont Pistol Powder No. 6.
Explosive Rivets.
Fulminate of Mercury.
High Temperature E.B. Caps, No. 6.

APPENDIX E—Continued

Authorized Explosives—Continued

E. I. DuPont de Nemours & Company, Inc., Wilmington, Del.—Continued

Improved Military Rifle Powders.
Jet Tappers.
Oil Well Explosives S.O.W.E. No. 1 and EL-431-A.
Nitramex No. 2.
"Nitramon S".
"Nitramon S" Primers.
Nitrocellulose.
Nitrostarch.
Open hole Shaped Charges (R.D.X. or Pentolite).
Pelletol Nos. 1 and 2.
Perforating Shaped Charges (R.D.X. or Pentolite).
P.E.T.N.
Pyro (ground smokeless) Powder.
R.D.X. Cord.
Smokeless Powders.
Sporting Rifle Powders.
Tetryl.
Waterproof Boosters C. 66.

Ellefsens Tendskruefabrikk, Stokke, Norway.
Time Fuses and Detonators for Whaling Guns.

Ensign Bickford Company, Simsbury, Conn.
Primacord Bickford Fuse.
Ignitacord.

Federal Laboratories, Pittsburgh, Pa.
Lachrymatory Cartridges.
Powder Loads.

Charles Hellis & Sons Ltd., London, England.
12 Gauge Shotgun Shells.

Hercules Powder Company, Wilmington, Del.
Detonators.
Gelatin Oil Well Explosives.
Nitrocellulose.
Smokeless Powders.
Vibro Caps.
Vibrogel B and 3.

Illinois Powder Manufacturing Co., St. Louis, Mo.
Detonators, Gold Medal Oil Well Explosive, 100 per cent.

Imperial Chemical Industries Limited, England.
Cerium Low Tension Fuseheads.
Detonating Relays.
Percussion Caps.

Independent Eastern Torpedo Company, Findlay, Ohio.
Nitroglycerine.

Jet Perforators Inc., Fort Worth, Texas.
Glass Gun Jet Perforating Charges, G.G. 2, G.G. 4, G.G. 7.

Lake Erie Chemical Co., Cleveland, Ohio.
Lachrymatory Cartridges.

Lane-Wells Co., Los Angles, Cal.
Gun Perforator Cartridges.

Authorized Explosives—Concluded

Mid Continent Torpedo Co. Ltd., Tulsa, Okla.
Red Head Firing Heads.

Mine Safety Appliances Co. Pittsburgh, Pa.
Stud Units for Velocity Power Driver.

Olin Industries Inc., East Alton, Ill.
(Western Cartridge Co. Division)
Cyclonite.

Pacific Railway Signal Co., Peru, Ind.
Railway Torpedoes.

Perforating Guns Co. Inc., Houston, Texas.
Jet Perforating Charges.

John R. Powell, Plymouth, Pa.
Miners' Safety Squibs.

Randolph Company, Houston, Texas.
Micro-log cartridges.
Baker plug setting tool cartridges.

Remington Arms Co. Inc., Bridgeport, Conn.
Stud Driver Cartridges.

F. J. Roberts Squib Company, Punxsutawney, Pa.
Miners' Safety Squibs.

Rohm-Gesellschaft, Sontheim/Brenz, Kreis Heidenheim, Germany.
6 m.m. Blank Cartridges.

Shaped Charge Manufacturers Inc., Martinsburg, W.Va.
Plurajet Blasting Units (Not for underground use).

Trojan Powder Company, Allentown, Pa.
Nitrostarch.

Western Cartridge Company, East Alton, Ill.
Detonators.
Kiln Gun Shells.

Winchester Arms Company, Cleveland, Ohio.
"Tempotool" Cartridges.

APPENDIX E—Concluded

Authorized Manufactured Fireworks

Fireworks manufactured by the following Canadian makers are authorized:

W. F. Bishop & Son Limited, Toronto, Ont.
Canadian Industries Limited, Montreal, Que.
Canadian Safety Fuse Company Limited, Brownsburg, Que.
Dominion Fireworks Co. Ltd., Dixie, Ont.
T. W. Hand Fireworks Co. Ltd., Cooksville, Ont.
Macdonald Metals and Plastics Limited, Waterloo, Que.
Montreal Fireworks Displays Manufacturing Company, Ville St. Pierre, Que.
Superior Toys, Waubaushene, Ont.

Certain fireworks manufactured outside of Canada by the following makers are authorized.*

Acme Fireworks Corporation (Acme Novelty Manufacturing Company), River Grove, Ill.
Aerial Products Incorporated, Merrick, L.I., N.Y.
American Railway Signal Company, Fostoria, Ohio.
Anthes Force Oiler Company, Fort Madison, Iowa.
Astra Fireworks Ltd., London, England.
Atlas Fireworks Co. Inc., Los Angeles 22, Cal.
M. Backes & Sons Limited, Wallingford, Conn.
J. G. W. Berchkholtz, Hamburg-Bahrenfeld, Germany.
Oswald Bradley Ltd., Southport, Lancs., England.
Brookside Pyrotechnic & Chemical Co., Elkton, Md.
C. T. Brock & Co., Hemel Hempstead, Herts, England.
Central Railway Signal Company, Boston, Mass.
Columbia Manufacturing Co. Inc., Elkton, Md.
Continental Fireworks Manufacturing Co., Dunbar, Pa.
J. Halpern Co., Pittsburgh, Pa., Distributors for Lenover Corporation, Chester Pa., and Lenover, Pa.
Thos. Hammond & Company, Craigmillar, Edinburgh, Scotland.
Hudson Fireworks Display Company, Hudson, Ohio.
Hitt Fireworks Company Limited, Seattle, Wash.
Interstate Fireworks Company, Springfield, Mass.
Japan Fireworks Trading Company Ltd., Tokyo, Japan.
Jatina Manufacturing Co. Inc., Mount Vernon, N.Y.
Kemode Manufacturing Co. Inc., New York, N.Y.
Kent Manufacturing Corporation, Chestertown, Md.
Kilgore Manufacturing Company, Westerville, Ohio.
Lakeside Railway Fusee Company, South Beloit, Ill.
Lenover Corporation, Chester, Pa., and Lenover, Pa.; J. Halpern, Pittsburgh, Pa.
Distributors.
Marutamaya Ogatsu Fireworks Co., Tokyo, Japan.
National Fireworks Incorporated, West Hanover, Mass.
Nichols Industries, Pasadena, Texas.
Pacific Railway Signal Co., Peru, Ind.
N. V. Pyro, Klazienaveen, Holland.
Pyrotechnischen Fabriken, Wuppertal-Ronsdorf, Germany.
Pyrowerk, Hamburg-Neugraben, Germany.
Red Flare Signal Company, Toledo, Ohio.
Reliance Snap Company, Bishop's Stortford, Herts, England.
Schermerly Pistol Rocket Apparatus Ltd., Newdigate, Surrey, England.
Standard Fireworks Limited, Huddersfield, England.
Standard Railway Fusee Corporation, Boonton, N.J.
J. and E. Stevens Sales Co., New York.
Thearle-Duffield Fireworks, Incorporated, Chicago, Ill.
Twin City Fireworks Company, Buffalo, N.Y.
Unexcelled Manufacturing Company, New York.
United Fireworks Manufacturing Company, Dayton, Ohio.
Van Karner Chemical Arms Corporation, New York.
Joseph Wells & Sons Limited, Dartford, Kent, England.
Joh. Chr. Wendt, Hamburg, Gr. Borstel, Germany.
Wunderkerzen-Werk Carl Fleming, Hamburg-Neugraben, Germany.

Chinese firecrackers with gunpowder composition, and not exceeding 4 inches in length and $\frac{1}{8}$ inch in diameter, and small Chinese fireworks, are authorized when found to function satisfactorily on examination at port of entry.

* A list of authorized fireworks is on file in the office of the Explosives Division. Information may be obtained on request.

